

Claims

- [c1] A method for joining and holding portions of a stomach to each other in the performance of a Nissen fundoplication procedure, the procedure requiring grasping the fundus of the stomach at a proximal location and pulling the fundus around the esophagus, wrapping the fundus around the esophagus one time and attaching the proximal stomach to an apposing portion of the stomach, the attachment made using a barbed suture including an elongated body, first and second sharp pointed distal ends for penetrating tissue, and a plurality of barbs extending from the periphery of the body, the barbs on a first portion of the body between the first end of the suture and a first axial location on the body for permitting movement of the suture through the tissue in a direction of movement of the first end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the first end, and the barbs on a second portion of the body between the second end of the suture and a second axial location on the body which is less than the distance from the second end to the first axial location permitting movement of the suture through the tissue in a direction of movement of the second end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the second end, the method comprising the steps of:
- (a) inserting the first pointed end of the suture into tissue of the proximal stomach;
 - (b) pushing the first end of the suture through the stomach tissue until the first end of the suture extends out of the tissue at an exit point on the exterior of the stomach;
 - (c) gripping and pulling the first end of the suture to draw the first portion of the suture through the tissue until the second axial location is proximate to the point of insertion of the first end of the suture and leaving a length of the first portion of the suture in the tissue between the point of insertion and exit point of the first end;
 - (d) gripping the proximal stomach and wrapping the fundus around the esophagus until the proximal stomach contacts an apposing portion of stomach;

- (e) inserting the second pointed end of the suture into tissue of the apposing stomach;
- (f) pushing the second end of the suture through the stomach tissue until the second end of the suture extends out of the tissue at an exit point on the exterior of the stomach; and
- (g) gripping and pulling the second end of the suture to draw the second portion of the suture through the tissue until the second axial location is proximate to the point of insertion of the second end of the suture and leaving a length of the second portion of the suture in the tissue between the point of insertion and exit point of the second end.

[c2]

A method for joining and holding portions of a stomach to each other in the performance of a Nissen fundoplication procedure, the procedure requiring grasping the fundus of the stomach at a proximal location and pulling the fundus around the esophagus, wrapping the fundus around the esophagus one time and attaching the proximal stomach to an apposing portion of the stomach, the attachment made using a barbed suture including an elongated body, first and second sharp pointed distal ends for penetrating tissue, and a plurality of barbs extending from the periphery of the body, the barbs on a first portion of the body between the first end of the suture and a first axial location on the body for permitting movement of the suture through the tissue in a direction of movement of the first end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the first end, and the barbs on a second portion of the body between the second end of the suture and a second axial location on the body which is less than the distance from the second end to the first axial location permitting movement of the suture through the tissue in a direction of movement of the second end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the second end, and using an insertion device including a tubular element in which the suture is initially disposed, the insertion device having leading and trailing ends with openings therein with the first end of the suture proximate to the leading end, the method comprising the steps of:

- (a)gripping the proximal stomach and wrapping the fundus around the esophagus until the proximal stomach contacts an apposing portion of stomach and forms a junction of the proximal and the apposing stomach tissues;
- (b)inserting the first pointed end of the suture and leading end of the insertion device into stomach tissue at a point laterally spaced from the junction and on a first side of the junction;
- (c)pushing the first end of the suture and leading end of the insertion device through the first side of stomach tissue and penetrating the stomach tissue on a second side of the junction until the portion of the suture between the first and second axial locations is proximate to the junction; and
- (d)gripping and pulling the insertion device at the trailing end to remove the insertion device, leaving the suture in place.

[c3]

A method for joining and holding portions of a stomach to each other in the performance of a Nissen fundoplication procedure, the procedure requiring grasping the fundus of the stomach at a proximal location and pulling the fundus around the esophagus, wrapping the fundus around the esophagus one time and attaching the proximal stomach to an apposing portion of the stomach, the attachment made using a barbed suture including an elongated body, first and second sharp pointed distal ends for penetrating tissue, and a plurality of barbs extending from the periphery of the body, the barbs on a first portion of the body between the first end of the suture and a first axial location on the body for permitting movement of the suture through the tissue in a direction of movement of the first end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the first end, and the barbs on a second portion of the body between the second end of the suture and a second axial location on the body which is less than the distance from the second end to the first axial location permitting movement of the suture through the tissue in a direction of movement of the second end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the second end, the method comprising the steps of:

- (a)gripping the proximal stomach and wrapping the fundus around the

esophagus until the proximal stomach contacts an apposing portion of stomach and forms a junction of the proximal and the apposing stomach tissues;

(b)inserting the first pointed end of the suture into the tissue at a first side of the junction;

(c)pushing the first end of the suture through the tissue until the first end of the suture extends out of the tissue at an exit point in the face of the junction below the surface of the tissue at the first side of the junction;

(d)gripping the first end of the suture and pulling the first end out of the tissue for drawing the first portion of the suture through the tissue until the second axial location is at the point of insertion of the first end of the suture and leaving a length of the first portion of the suture in the tissue between the point of insertion in the first side of the junction and the exit point in the face of the junction at the first side of the junction;

(e)inserting the first end of the suture into the face of the tissue below the surface of the tissue at a second side of the junction;

(f)pushing the first end of the suture through the tissue until the first end of the suture extends out of the tissue at an exit point on the second side of the junction longitudinally spaced in a first direction from the insertion point in the first side of the junction;

(g)gripping the first end of the suture and pulling the first end out of the tissue for drawing the first portion of the suture through the tissue while bringing the two sides of the junction together to a closed position along the first portion of the suture in the tissue and leaving a length of the first portion of the suture in the tissue between the point of insertion in the first side of the junction and the exit point in the second side of the junction;

(h)inserting the second pointed end of the suture into the tissue at one side of the junction;

(i)pushing the second end of the suture through the tissue until the second end of the suture extends out of the tissue at an exit point in the face of the tissue below the surface of the tissue at the one side of the junction;

(j)gripping the second end of the suture and pulling the second end out of the tissue for drawing the second portion of the suture through the tissue until the second axial location is at the point of insertion of the second end of the suture

and leaving a length of the second portion of the suture in the tissue between the point of insertion in the one side of the junction and the exit point in the face of the junction at the one side of the junction;

(k)inserting the second end of the suture into the face of the tissue below the surface of the tissue at the other side of the junction;

(l)pushing the second end of the suture through the tissue until the second end of the suture extends out of the tissue at an exit point on the other side of the junction longitudinally spaced in a second direction from the point of insertion of the second end of the suture at the one side of the junction; and

(m)gripping the second end of the suture and pulling the second end out of the tissue for drawing the second portion of the suture through the tissue while bringing the sides of the junction together to the closed position along the second portion of the suture in the tissue and leaving a length of the second portion of the suture in the tissue between the point of insertion in the one side of the junction and the exit point in the other side of the junction.

[c4] A method for joining and holding portions of a stomach to each other as recited in claim 3, wherein the initial point of insertion of the first pointed end of the suture is laterally spaced from the face of the junction at the first side of the junction.

[c5] A method for joining and holding portions of a stomach to each other as recited in claim 3, wherein the initial point of insertion of the first pointed end of the suture is into the face of the junction below the surface of the tissue at the first side of the junction.

[c6] A method for joining and holding portions of a stomach to each other as recited in claim 3, wherein the steps of pushing the ends of the suture through the tissue comprise pushing the suture along a curvilinear path.

[c7] A method for joining and holding portions of a stomach to each other as recited in claim 3, wherein the steps of pushing the ends of the suture comprise pushing the suture along a straight path.

[c8] A method for joining and holding portions of a stomach to each other in the

performance of a Nissen fundoplication procedure, the procedure requiring grasping the fundus of the stomach at a proximal location and pulling the fundus around the esophagus, wrapping the fundus around the esophagus one time and attaching the proximal stomach to an apposing portion of the stomach, the attachment made using a barbed suture including an elongated body, first and second sharp pointed distal ends for penetrating tissue, and a plurality of barbs extending from the periphery of the body, the barbs on a first portion of the body between the first end of the suture and a first axial location on the body for permitting movement of the suture through the tissue in a direction of movement of the first end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the first end, and the barbs on a second portion of the body between the second end of the suture and a second axial location on the body which is less than the distance from the second end to the first axial location permitting movement of the suture through the tissue in a direction of movement of the second end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the second end, the method comprising the steps of:

- (a)gripping the proximal stomach and wrapping the fundus around the esophagus until the proximal stomach contacts an apposing portion of stomach and forms a junction of the proximal and the apposing stomach tissues;
- (b)inserting the first pointed end of the suture into the stomach tissue below the surface of the stomach tissue at a first face of the junction;
- (c)pushing the first end of the suture through the stomach tissue along a curvilinear path until the first end of the suture extends from the stomach tissue at an exit point in the first face of the junction longitudinally spaced in a first direction from the insertion point in the first face of the junction;
- (d)gripping the first pointed end of the suture and pulling the first end out of the stomach tissue for drawing the first portion of the suture through the stomach tissue until the second axial location is at the point of insertion of the first end of the suture in the first face of the junction and leaving a length of the first portion of the suture in the stomach tissue of the junction;
- (e)inserting the first pointed end of the suture at a point below the surface of

the stomach tissue in a second face of the junction;

(f)pushing the first end of the suture through the stomach tissue along a curvilinear path until the first end of the suture extends from the stomach tissue at an exit point in the second face of the junction below the surface of the stomach tissue and longitudinally spaced in the first direction from the insertion point in the second face of the junction;

(g)repeating steps (b) through (f) for advancing longitudinally along the junction in the first direction as necessary to one end of the junction;

(h)inserting the second pointed end of the suture into the stomach tissue of the second face of the junction below the surface of the stomach tissue and adjacent the initial point of insertion of the first end in the first face of the junction;

(i)pushing the second end of the suture through the stomach tissue along a curvilinear path until the second end of the suture extends from the stomach tissue at an exit point below the surface of the stomach tissue in the second face of the junction and longitudinally spaced in a second direction from the point of insertion in the second face of the junction;

(j)gripping the second pointed end of the suture and pulling the second end out of the stomach tissue for drawing the second portion of the suture through the stomach tissue until the second axial location is at the point of insertion of the second pointed end in the second face of the junction and leaving a length of the second portion of the suture in the stomach tissue of the junction;

(k)inserting the second pointed end of the suture at a point in the first face of the junction below the surface of the stomach tissue;

(l)pushing the second end of the suture through the stomach tissue along a curvilinear path until the second end of the suture extends from the stomach tissue at an exit point in the first face of the junction below the surface of the stomach tissue and longitudinally spaced in the second direction from the point of insertion of the second end of the suture in the first face of the junction; and

(m)repeating steps (h) through (l) for advancing longitudinally along the junction in the second direction to the other end of the junction.

[c9]

A method for joining and holding portions of a stomach to each other as recited

- _____

insertion device, leaving the suture in place.

[c12] A method for laparoscopically inserting a suture in a surgical procedure as recited in claim 11, wherein the procedure comprises stabilizing a bowel structure in position in preparation for additional procedures such as a laparoscopic anastomosis and the tissue in the abdominal cavity into which the suture is inserted is bowel tissue, and further comprising the steps of:

- (a)gripping and positioning the bowel structure in a location for stabilization;
- and
- (b)leaving the inserted suture in place in the bowel tissue and the abdominal wall.

[c13] A method for laparoscopically inserting a suture in a surgical procedure as recited in claim 11, wherein the procedure comprises a closure of a wound resulting from a cystostomy, the tissue into which the suture is inserted is urinary bladder muscularis, the entry point in the muscularis tissue is spaced from and on one side of the wound, and the first end of the suture and leading end of the insertion device are pushed through the tissue until the first end of the suture and the leading end of the insertion device extend out of the tissue at the wound, and further comprising the steps of:

- (a)inserting the first pointed end of the suture and the leading end of the insertion device through an opposing side of the wound;
- (b)pushing the first end of the suture and leading end of the insertion device through the tissue until the second axial location is proximate to a central to the point of the wound; and
- (c)advancing the tissue on the two sides of the lesion together as necessary to close the wound.

[c14] A method for performing an anastomosis of the liver bile duct to a bowel structure, the bile duct having one end connected to the liver and a free end after having been severed, and the bowel structure having an opening in its wall made to receive the annular free end of the bile duct, using a barbed suture including an elongated body, first and second sharp pointed distal ends for penetrating tissue, and a plurality of barbs extending from the periphery of the

body, the barbs on a first portion of the body between the first end of the suture and a first axial location on the body for permitting movement of the suture through the tissue in a direction of movement of the first end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the first end, and the barbs on a second portion of the body between the second end of the suture and a second axial location on the body which is less than the distance from the second end to the first axial location permitting movement of the suture through the tissue in a direction of movement of the second end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the second end, and using an insertion device including a tubular element in which the suture is initially disposed, the insertion device having leading and trailing ends with openings therein with the first end of the suture proximate to the leading end, the method comprising the steps of:

- (a) placing the free end of the bile duct in contact with the opening in the bowel structure, forming a junction at the annular contact area between the bile duct tissue and the bowel structure tissue;
- (b) inserting the first pointed end of the suture and the leading end of the insertion device into the tissue on one side of the junction;
- (c) pushing the first end of the suture and leading end of the insertion device through the tissue on one side of the junction, through the junction, and penetrating tissue on the other side of the junction;
- (d) gripping and pulling the insertion device at the trailing end to remove the insertion device, leaving the suture in place in both the bile duct tissue and the bowel structure tissue;
- (e) repeating steps (b) through (d) with additional sutures around the junction as necessary to provide an anastomotic seal at the junction.

[c15]

A method for performing an anastomosis of the liver bile duct to a bowel structure, the bile duct having one end connected to the liver and a free end after having been severed, and the bowel structure having an opening in its wall made to receive the annular free end of the bile duct, the bile duct comprising one of a first tissue and a second tissue, and the bowel tissue comprising the

other of the first tissue and second tissue, using a barbed suture including an elongated body, first and second sharp pointed distal ends for penetrating tissue, and a plurality of barbs extending from the periphery of the body, the barbs on a first portion of the body between the first end of the suture and a first axial location on the body for permitting movement of the suture through the tissue in a direction of movement of the first end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the first end, and the barbs on a second portion of the body between the second end of the suture and a second axial location on the body which is less than the distance from the second end to the first axial location permitting movement of the suture through the tissue in a direction of movement of the second end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the second end, the method comprising the steps of:

- (a) placing the free end of the bile duct in contact with the opening in the bowel structure, forming a junction at the annular contact area between the bile duct tissue and the bowel structure tissue;
- (b) inserting the first pointed end of the suture into the first tissue at a point spaced from the junction;
- (c) pushing the first end of the suture through the first tissue until the first end of the suture extends out of the first tissue at an exit point and penetrating the second tissue at a face of the junction until the first end of the suture extends out of the second tissue at an exit point spaced from the junction and spaced in a first direction along the circumference of the junction from the point of insertion of the first end of the suture in the first tissue;
- (d) gripping the first end of the suture and pulling the first end out of the second tissue for drawing the first portion of the suture through the first tissue and the second tissue while bringing the first tissue and the second tissue together to a closed position along the first portion of the suture until the second axial location is at the point of insertion of the first end of the suture at the one side of the first tissue and leaving a length of the first portion of the suture in the first tissue and the second tissue between the point of insertion and the exit point;

- (m)pushing the second end of the suture through the second tissue until the second end of the suture extends out of the second tissue at an exit point in the face of the junction and penetrating the first tissue until the second end of the suture extends out of the first tissue at an exit point spaced from the junction and spaced along the circumference of the junction in a second direction from the point of insertion of the second end of the suture;
- (n)gripping the second pointed end of the suture and pulling the second end out of the first tissue for drawing the second portion of the suture through the first tissue and second tissue while bringing the first tissue and the second tissue together to a closed position along the second portion of the suture until the second axial location is at the point of insertion of the first end of the suture at the one side of the junction and leaving a length of the second portion of the suture in the first tissue and the second tissue between the point of insertion and the exit point; and
- (o)repeating steps (i) through (n) around the junction as necessary to provide an anastomotic seal at the junction.

[c16]

A method for tying off an appendiceal stump resulting from the performance of an appendectomy, the appendix extending from the cecum of the large intestine and having a base with a circumference at the juncture of the appendix and the cecum, using a barbed suture including an elongated body, first and second sharp pointed distal ends for penetrating tissue, and a plurality of barbs extending from the periphery of the body, the barbs on a first portion of the body between the first end of the suture and a first axial location on the body for permitting movement of the suture through the tissue in a direction of movement of the first end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the first end, and the barbs on a second portion of the body between the second end of the suture and a second axial location on the body which is less than the distance from the second end to the first axial location permitting movement of the suture through the tissue in a direction of movement of the second end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the second end, the method comprising the steps

of:

- (a)inserting the first pointed end of the suture into tissue of the cecum proximate to the appendix base;
- (b)pushing the first end of the suture around the circumference of the base in one direction for at least one half of the of the circumference of the base until extending through an exit point in the tissue;
- (c)inserting the second pointed end of the suture into tissue of the cecum proximate to the entry point of the first end;
- (d)pushing the second end of the suture along the circumference of the base in the other direction for at least one half of the of the circumference of the base until extending through an exit point in the tissue;
- (e)excising the appendix, leaving the appendiceal stump; and
- (f)gripping and pulling the ends of the suture, causing the suture to tighten around the appendiceal stump.

[c17] The method of claim 16, further comprising the step of inverting the appendiceal stump such that the stump is disposed within the cecum.

[c18] A method for joining and holding closed the muscle layers that define the orifice of a Zenker"s Diverticulum, the Zenker"s Diverticulum including a sac extending from a proximal location of the esophagus near the pharynx, the sac having walls including a muscle layer common to the proximal esophagus, using a barbed suture including an elongated body, first and second sharp pointed distal ends for penetrating tissue, and a plurality of barbs extending from the periphery of the body, the barbs on a first portion of the body between the first end of the suture and a first axial location on the body for permitting movement of the suture through the tissue in a direction of movement of the first end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the first end, and the barbs on a second portion of the body between the second end of the suture and a second axial location on the body which is less than the distance from the second end to the first axial location permitting movement of the suture through the tissue in a direction of movement of the second end and preventing movement of the suture relative to the tissue in a direction opposite the

direction of movement of the second end, and using an endoscopic insertion device that passes through the mouth, throat, and pharynx, including a tubular element in which the suture is initially disposed, the insertion device having leading and trailing ends with openings therein with the first end of the suture proximate to the leading end, the method comprising the steps of:

- (a) inserting the first pointed end of the suture and the leading end of the endoscopic insertion device through an entry point in the esophageal muscle between the pharynx and the orifice, and spaced from the orifice on the side of the orifice towards the mouth;
- (b) pushing the first end of the suture and leading end of the insertion device through the muscle until the first end of the suture and the leading end of the insertion device extend out of the muscle at the orifice of the sac;
- (c) inserting the first pointed end of the suture and the leading end of the endoscopic insertion device through an opposing side of the orifice;
- (d) pushing the first end of the suture and leading end of the insertion device through the muscle until the second axial location is proximate to a central point of the orifice;
- (e) gripping and pulling the insertion device at the trailing end to remove the insertion device, leaving the suture in place;
- (f) optionally repeating steps (a) through (e) as desired with additional sutures; and
- (g) advancing the muscle on the two sides of the orifice together as necessary to close the orifice.

[c19]

A method for joining and holding closed ulcerative lesions or post-procedural tissue defects on an interior surface of a viscus, using a barbed suture including an elongated body, first and second sharp pointed distal ends for penetrating tissue, and a plurality of barbs extending from the periphery of the body, the barbs on a first portion of the body between the first end of the suture and a first axial location on the body for permitting movement of the suture through the tissue in a direction of movement of the first end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the first end, and the barbs on a second portion of the body

between the second end of the suture and a second axial location on the body which is less than the distance from the second end to the first axial location permitting movement of the suture through the tissue in a direction of movement of the second end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the second end, and using an endoscopic insertion device, including a tubular element in which the suture is initially disposed, the insertion device having leading and trailing ends with openings therein with the first end of the suture proximate to the leading end, the method comprising the steps of:

- (a) inserting the first pointed end of the suture and the leading end of the endoscopic insertion device through an entry point in the tissue spaced from and on one side of the lesion;
- (b) pushing the first end of the suture and leading end of the insertion device through the tissue until the first end of the suture and the leading end of the insertion device extend out of the tissue at the lesion;
- (c) inserting the first pointed end of the suture and the leading end of the endoscopic insertion device through an opposing side of the lesion;
- (d) pushing the first end of the suture and leading end of the insertion device through the tissue until the second axial location is proximate to a central to the point of the lesion;
- (e) gripping and pulling the insertion device at the trailing end to remove the insertion device, leaving the suture in place; and
- (f) optionally repeating steps (a) through (e) as desired with additional sutures;
- (g) advancing the tissue on the two sides of the lesion together as necessary to close the lesion.

[c20]

A method for joining and holding closed a wound in urinary bladder muscularis tissue to allow tissue healing and regrowth together of the sides of the wound, or reconfiguration in vivo, using a barbed suture including an elongated body, first and second sharp pointed distal ends for penetrating tissue, and a plurality of barbs extending from the periphery of the body, the barbs on a first portion of the body between the first end of the suture and a first axial location on the body for permitting movement of the suture through the tissue in a direction of

movement of the first end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the first end, and the barbs on a second portion of the body between the second end of the suture and a second axial location on the body which is less than the distance from the second end to the first axial location permitting movement of the suture through the tissue in a direction of movement of the second end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the second end, the method comprising the steps of:

- (a) inserting the first pointed end of the suture into the tissue below the surface of the tissue at a first face of the wound at an initial point;
- (b) pushing the first end of the suture through the tissue along a curvilinear path until the first end of the suture extends from the tissue at an exit point in the first face of the wound and longitudinally spaced in a first direction from the insertion point in the first face of the wound;
- (c) gripping the first pointed end of the suture and pulling the first end out of the tissue for drawing the first portion of the suture through the tissue until the second axial location is at the point of insertion of the first end of the suture in the first face of the wound and leaving a length of the first portion of the suture in the tissue;
- (d) inserting the first pointed end of the suture at a point below the surface of the tissue in a second face of the wound;
- (e) pushing the first end of the suture through the tissue along a curvilinear path until the first end of the suture extends from the tissue at an exit point in the second face of the wound below the surface of the tissue and longitudinally spaced in the first direction from the insertion point in the second face of the wound;
- (f) repeating steps (a) through (e) for advancing longitudinally along the wound in the first direction as necessary to one end of the wound;
- (g) inserting the second pointed end of the suture into the tissue of the second face of the wound below the surface of the tissue and adjacent the initial point of insertion of the first end in the first face of the wound;
- (h) pushing the second end of the suture through the tissue along a curvilinear

path until the second end of the suture extends from the tissue at an exit point below the surface of the tissue in the second face of the wound and longitudinally spaced in a second direction from the point of insertion in the second face of the wound;

(i)gripping the second pointed end of the suture and pulling the second end out of the tissue for drawing the second portion of the suture through the tissue until the second axial location is at the point of insertion of the second pointed end in the second face of the wound and leaving a length of the second portion of the suture in the tissue;

(j)inserting the second pointed end of the suture at a point in the first face of the wound below the surface of the tissue;

(k)pushing the second end of the suture through the tissue along a curvilinear path until the second end of the suture extends from the tissue at an exit point in the first face of the wound below the surface of the tissue and longitudinally spaced in the second direction from the point of insertion of the second end of the suture in the first face of the wound; and

(l)repeating steps (g) through (k) for advancing longitudinally along the wound in the second direction to the other end of the wound.

[c21] A method for joining and holding closed a wound in urinary bladder muscularis tissue as recited in claim 20, wherein the initial point of insertion of the first pointed end of the suture is adjacent an end of the junction and the first direction and second direction are the same direction.

[c22] A method for joining and holding closed a wound in urinary bladder muscularis tissue as recited in claim 20, wherein the initial point of insertion of the first pointed end of the suture is longitudinally spaced from and between the ends of the junction and the first direction and second direction are opposite directions.

[c23] A method for joining and holding closed a wound in urinary bladder muscularis tissue to allow tissue healing and regrowth together of the sides of the wound, or reconfiguration in vivo, using a barbed suture including an elongated body, first and second sharp pointed distal ends for penetrating tissue, and a plurality of barbs extending from the periphery of the body, the barbs on a first portion

of the body between the first end of the suture and a first axial location on the body for permitting movement of the suture through the tissue in a direction of movement of the first end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the first end, and the barbs on a second portion of the body between the second end of the suture and a second axial location on the body which is less than the distance from the second end to the first axial location permitting movement of the suture through the tissue in a direction of movement of the second end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the second end, the method comprising the steps of:

- (a) inserting the first pointed end of the suture into the muscularis tissue below the surface of the muscularis tissue at a first face of the wound at an initial point;
- (b) pushing the first end of the suture through the muscularis tissue along a curvilinear path until the first end of the suture extends from the muscularis tissue at an exit point in the first face of the wound longitudinally spaced in a first direction from the insertion point in the first face of the wound;
- (c) gripping the first pointed end of the suture and pulling the first end out of the muscularis tissue for drawing the first portion of the suture through the muscularis tissue until the second axial location is at the point of insertion of the first end of the suture in the first face of the wound and leaving a length of the first portion of the suture in the muscularis tissue of the wound;
- (d) inserting the first pointed end of the suture at a point below the surface of the muscularis tissue in a second face of the wound;
- (e) pushing the first end of the suture through the muscularis tissue along a curvilinear path until the first end of the suture extends from the muscularis tissue at an exit point in the second face of the wound below the surface of the muscularis tissue and longitudinally spaced in the first direction from the insertion point in the second face of the wound;
- (f) inserting the first end of the suture at a point in the first face of the wound below the surface of the muscularis tissue;
- (g) repeating steps (b) through (f) for advancing longitudinally along the wound

in the first direction as necessary to one end of the wound;

(h) inserting the second pointed end of the suture into the muscularis tissue of the second face of the wound below the surface of the muscularis tissue and adjacent the initial point of insertion of the first end in the first face of the wound;

(i) pushing the second end of the suture through the muscularis tissue along a curvilinear path until the second end of the suture extends from the muscularis tissue at an exit point below the surface of the muscularis tissue in the second face of the wound and longitudinally spaced in a second direction from the point of insertion in the second face of the wound;

(j) gripping the second pointed end of the suture and pulling the second end out of the muscularis tissue for drawing the second portion of the suture through the muscularis tissue until the second axial location is at the point of insertion of the second needle in the second face of the wound and leaving a length of the second portion of the suture in the muscularis tissue of the wound;

(k) inserting the second pointed end of the suture at a point in the first face of the wound below the surface of the muscularis tissue;

(l) pushing the second end of the suture through the muscularis tissue along a curvilinear path until the second end of the suture extends from the muscularis tissue at an exit point in the first face of the wound below the surface of the muscularis tissue and longitudinally spaced in the second direction from the point of insertion of the second end of the suture in the first face of the wound;

(m) inserting the second pointed end of the suture at a point in the first face of the wound below the surface of the muscularis tissue; and

(n) repeating steps (i) through (m) for advancing longitudinally along the wound in the second direction to the other end of the wound.

[c24] A method for joining and holding closed a wound in urinary bladder muscularis tissue as recited in claim 23, wherein the initial point is adjacent an end of the junction and the first direction and second direction are the same direction.

[c25] A method for joining and holding closed a wound in urinary bladder muscularis tissue as recited in claim 23, wherein the initial point is longitudinally spaced from and between the ends of the junction and the first direction and second

direction are opposite directions.

[c26]

A method for joining a foreign element and bodily tissue, the foreign element having a periphery, the bodily tissue having a fibrous tissue ring with a face of the fibrous tissue ring defining an opening and apposing a face of the periphery, with both the foreign element and the tissue comprising matter, and holding closed a junction between the element and the tissue to allow tissue healing and regrowth, or reconfiguration in vivo, using a barbed suture including an elongated body, first and second sharp pointed distal ends for penetrating tissue, and a plurality of barbs extending from the periphery of the body, the barbs on a first portion of the body between the first end of the suture and a first axial location on the body for permitting movement of the suture through the tissue in a direction of movement of the first end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the first end, and the barbs on a second portion of the body between the second end of the suture and a second axial location on the body which is less than the distance from the second end to the first axial location permitting movement of the suture through the tissue in a direction of movement of the second end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the second end, the method comprising the steps of:

- (a) inserting the first pointed end of the suture into matter on a first side of the junction at a point radially spaced from the junction;
- (b) pushing the first end of the suture through the matter on the first side until the first end of the suture extends out of the first side matter at an exit point and penetrating the face of the matter on the second side of the junction until the first end of the suture extends out of the second side matter at an exit point radially spaced from the junction and spaced along the junction circumference in a first direction from the point of insertion of the first end of the suture in the first side matter;
- (c) gripping the first end of the suture and pulling the first end out of the second side matter for drawing the first portion of the suture through the first and second side matter while bringing the first and second side matter together to a

closed position along the first portion of the suture until the second axial location is at the point of insertion of the first end of the suture in the first side matter and leaving a length of the first portion of the suture in the first and second side matter between the point of insertion and the exit point;

(d)inserting the first end of the suture into the second side matter at the exit point of the first end;

(e)pushing the first end of the suture through the second side matter until the first end of the suture extends out of the second side matter at an exit point in the face of the second side matter and penetrating the first side matter until the first end of the suture extends out of the first side matter at an exit point radially spaced from the junction and spaced along the junction circumference in the first direction from the point of insertion of the first end of the suture in the first side matter;

(f)gripping the first end of the suture and pulling the first end out of the first side matter for drawing the first portion of the suture through the first and second side matter while bringing the first and second side matter together to a closed position along the first portion of the suture and leaving a length of the first portion of the suture in the first side matter between the point of insertion and the exit point;

(g)repeating steps (a) through (f), with each repetition advancing along the junction circumference in the first direction;

(h)inserting the second end of the suture into the first side matter at the insertion point of the first end;

(i)pushing the second end of the suture through the first side matter until the second end of the suture extends out of the first side matter at an exit point and penetrating the face of the second side matter until the second end of the suture extends out of the second side matter at an exit point radially spaced from the junction and spaced along the junction circumference in the second direction from the point of insertion of the second end of the suture on the first side matter; and

(j)gripping the second end of the suture and pulling the second end out of the second side matter for drawing the second portion of the suture through the second side matter while bringing the first side matter and the second side

matter together to the closed position along the second portion of the suture and leaving a length of the second portion of the suture in the first and second side matter between the point of insertion and the exit point;

(k) inserting the second pointed end of the suture into the second side matter at the exit point of the second end;

(l) pushing the second end of the suture through the second side matter until the second end of the suture extends out of the second side matter at an exit point in the face of the second side matter and penetrating the first side matter until the second end of the suture extends out of the first side matter at an exit point radially spaced from the junction and spaced along the junction circumference in a second direction from the point of insertion of the second end of the suture;

(m) gripping the second pointed end of the suture and pulling the second end out of the periphery for drawing the second portion of the suture through the first and second side matter while bringing the first and second side matter together to a closed position along the second portion of the suture until the second axial location is at the point of insertion of the first end of the suture in the second side matter and leaving a length of the second portion of the suture in the first and second side matter between the point of insertion and the exit point; and

(n) repeating steps (h) through (m), with each repetition advancing along the junction circumference in the second direction.

- [c27] A method for joining a foreign element and bodily tissue as recited in claim 26, wherein the foreign element is a bioprosthetic heart valve and the tissue is heart tissue.
- [c28] A method for joining a foreign element and bodily tissue as recited in claim 26, wherein the foreign element is a mechanical prosthetic heart valve and the tissue is heart tissue.
- [c29] A method for joining a foreign element and bodily tissue as recited in claim 26, wherein the foreign element is a bioprosthetic patch for cardiac septal defects and the tissue is heart tissue.

- [c30] A method for joining a foreign element and bodily tissue as recited in claim 26, further comprising the step of continuing to advance the first portion and the second portion of the sutures at least until the entire periphery is joined to the tissue.
- [c31] A method for joining a foreign element and bodily tissue as recited in claim 26, further comprising the step of continuing to advance the first portion and the second portion of the sutures until the first and second portion overlap for at least one quarter of the periphery.
- [c32] A method for joining a foreign element and bodily tissue, the foreign element having a periphery, the bodily tissue having a fibrous tissue ring with a face of the fibrous tissue ring defining an opening and apposing a face of the periphery, with both the foreign element and the tissue comprising matter, and holding closed a junction between the element and the tissue to allow tissue healing and regrowth, or reconfiguration in vivo, using a barbed suture including an elongated body, first and second sharp pointed distal ends for penetrating tissue, and a plurality of barbs extending from the periphery of the body, the barbs on a first portion of the body between the first end of the suture and a first axial location on the body for permitting movement of the suture through the tissue in a direction of movement of the first end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the first end, and the barbs on a second portion of the body between the second end of the suture and a second axial location on the body which is less than the distance from the second end to the first axial location permitting movement of the suture through the tissue in a direction of movement of the second end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the second end, the method comprising the steps of:
- (a) inserting the first pointed end of the suture into the first side matter below the surface of the first side matter at a first face of the junction;
 - (b) pushing the first end of the suture through the first side matter along a curvilinear path until the first end of the suture extends from the first side matter at an exit point in the first face of the junction below the surface of the

first side matter and spaced along the junction circumference in a first direction from the insertion point in the first face of the junction;

(c)gripping the first pointed end of the suture and pulling the first end out of the first side matter for drawing the first portion of the suture through the first side matter until the second axial location is at the point of insertion of the first end of the suture in the first face of the junction and leaving a length of the first portion of the suture in the first side matter;

(d)inserting the first pointed end of the suture at a point below the surface of the second side matter in a second face of the junction;

(e)pushing the first end of the suture through the second side matter along a curvilinear path until the first end of the suture extends from the second side matter at an exit point in the second face of the junction below the surface of the second side matter and spaced along the junction circumference in the first direction from the insertion point in the second face of the junction;

(f)repeating steps (a) through (e) for advancing longitudinally along the junction circumference in the first direction;

(g)inserting the second pointed end of the suture into the second side matter of the second face of the junction below the surface of the second side matter and adjacent the initial point of insertion of the first end in the first face of the wound;

(h)pushing the second end of the suture through the second side matter along a curvilinear path until the second end of the suture extends from the second side matter at an exit point below the surface of the second side matter in the second face of the junction and spaced along the junction circumference in a second direction from the point of insertion in the second face of the junction;

(i)gripping the second pointed end of the suture and pulling the second end out of the second side matter for drawing the second portion of the suture through the second side matter until the second axial location is at the point of insertion of the second pointed end in the second face of the junction and leaving a length of the second portion of the suture in the second side matter;

(j)inserting the second pointed end of the suture at a point in the first face of the wound below the surface of the first side matter;

(k)pushing the second end of the suture through the first side matter along a

curvilinear path until the second end of the suture extends from the first side matter at an exit point in the first face of the junction below the surface of the first side matter and spaced along the junction circumference in the second direction from the point of insertion of the second end of the suture in the first face of the junction; and
(l)repeating steps (g) through (k) for advancing longitudinally along the wound in the second direction to the other end of the wound.

[c33] A method for joining a foreign element and bodily tissue as recited in claim 32, wherein the foreign element is a bioprosthetic heart valve and the tissue is heart tissue.

[c34] A method for joining a foreign element and bodily tissue as recited in claim 32, wherein the foreign element is a mechanical prosthetic heart valve and the tissue is heart tissue.

[c35] A method for joining a foreign element and bodily tissue as recited in claim 32, wherein the foreign element is a bioprosthetic patch for cardiac septal defects and the tissue is heart tissue.

[c36] A method for joining a foreign element and bodily tissue as recited in claim 32, further comprising the step of continuing to advance the first portion and the second portion of the sutures at least until the entire periphery is joined to the tissue.

[c37] A method for joining a foreign element and bodily tissue as recited in claim 32, further comprising the step of continuing to advance the first portion and the second portion of the sutures until the first and second portion overlap for at least one quarter of the periphery.

[c38] A method of mounting a device to bodily tissue, the device including at least one eyelet for securing the device and through which a suture may pass, using a barbed suture including an elongated body, first and second sharp pointed distal ends for penetrating tissue, and a plurality of barbs extending from the periphery of the body, the barbs on a first portion of the body between the first end of the suture and a first axial location on the body for permitting movement

- (a) placing the device in a desired position;
 - (b) threading a suture through the at least one eyelet;
 - (c) inserting the first pointed end of the suture into tissue;
 - (d) pushing the first end of the suture through the tissue until the first end of the suture extends out of the tissue at an exit point;
 - (e) gripping the first end of the suture and pulling the first end out of the tissue while drawing the first portion of the suture through the tissue, leaving a portion of the suture between the first and second axial locations out of the tissue and leaving a length of the first portion of the suture in the tissue between the point of insertion and exit point of the first end;
 - (f) inserting the second pointed end of the suture into tissue;
 - (g) pushing the second end of the suture through the tissue until the second end of the suture extends out of the tissue at an exit point, leaving a portion of the suture between the first and second axial locations out of the tissue; and
 - (h) gripping the second end of the suture and pulling the second end out of the tissue while drawing the second portion of the suture through the tissue until the device is secured and leaving a length of the second portion of the suture in the tissue between the point of insertion and exit point of the second end;
- wherein the first and second portions of the suture extend in the tissue in generally opposing directions and cause the suture to resist displacement of the device.

A method for mounting a device to bodily tissue as recited in claim 38, wherein the device is a catheter.

[c40] A method for mounting a device to bodily tissue as recited in claim 38, wherein the device is a tumor monitor.

[c41] A method for mounting a device to bodily tissue as recited in claim 38, wherein the device is an electrode of a cardiac pacemaker.

[c42] A method for mounting a device to bodily tissue as recited in claim 38, wherein the bodily tissue to which the device is mounted is an internal organ.

[c43] A method for mounting a device to bodily tissue as recited in claim 38, wherein the bodily tissue to which the device is mounted includes the skin.

[c44] A method for mounting a device to bodily tissue as recited in claim 38, wherein at least one of the first and second sutures is inserted in a curvilinear path.

[c45] A method of performing a cosmetic surgery procedure using a barbed suture including an elongated body, first and second sharp pointed distal ends for penetrating tissue, and a plurality of barbs extending from the periphery of the body, the barbs on a first portion of the body between the first end of the suture and a first axial location on the body for permitting movement of the suture through the tissue in a direction of movement of the first end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the first end, and the barbs on a second portion of the body between the second end of the suture and a second axial location on the body which is less than the distance from the second end to the first axial location permitting movement of the suture through the tissue in a direction of movement of the second end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the second end, the method comprising the steps of:

- (a) inserting the first pointed end at an insertion point on the surface of a person's body;
- (b) pushing the first end of the suture through soft tissue until the first end of the suture extends out of the soft tissue at an exit point;
- (c) gripping and pulling the first end of the suture to draw the first portion of the suture through the soft tissue until the second axial location is proximate to the

point of insertion of the first end of the suture and leaving a length of the first portion of the suture in the soft tissue between the point of insertion and exit point of the first end;

(d)inserting the second pointed end of the suture at the point of insertion of the first end;

(e)pushing the second end of the suture through soft tissue until the second end of the suture extends out of the soft tissue at an exit point;

(f)gripping and pulling the second end of the suture to draw the second portion of the suture through the soft tissue until the second axial location is proximate to the point of insertion of the second end of the suture and leaving a length of the second portion of the suture in the soft tissue between the point of insertion and exit point of the second end; and

(g)manually grouping and advancing the soft tissue along at least one portion of the suture to provide a desired amount of lift.

[c46] A method of performing a cosmetic surgery procedure as recited in claim 45, wherein:

(a)the cosmetic surgery procedure is a facelift and the insertion point is approximately at the temporal hairline;

(b)the first end of the suture is pushed through subepidermal tissue to the exit point on the scalp;

(c)the second end of the suture is pushed through subepidermal tissue, the superficial muscular aponeurotic system, or combinations thereof, to the exit point proximate to the nasolabial fold; and

(d)tissue is manually grouped and advanced along the second portion of the suture to provide the desired amount of lift.

[c47] A method of performing a cosmetic surgery procedure as recited in claim 45, wherein:

(a)the cosmetic surgery procedure is a browlift and the insertion point is on a person's face above the brow line;

(b)the first end of the suture is pushed through subepidermal tissue underneath the scalp and the exit point of the first end of the suture is on the scalp;

(c)the second end of the suture is pushed through subepidermal tissue and the

exit point of the second end of the suture is proximate to the brow; and
(d)the tissue is manually grouped and advanced along the second portion of the suture to provide the desired amount of lift.

[c48] A method of performing a cosmetic surgery procedure as recited in claim 47, wherein the insertion point is approximately at the frontal hairline.

[c49] A method of performing a cosmetic surgery procedure as recited in claim 47, wherein the insertion point is approximately at the midpoint between the brow and the frontal hairline.

[c50] A method of performing a cosmetic surgery procedure as recited in claim 45, wherein:
(a)the cosmetic surgery procedure is a browlift and the insertion point is on a person's face above the brow line;
(b)the first end of the suture is pushed through subepidermal tissue and the exit point of the first end of the suture is proximate to the brow;
(c)the second end of the suture is pushed through subepidermal tissue and the exit point of the second end of the suture is proximate to the brow and spaced from the exit point of the first end of the suture; and
(d)the tissue is manually grouped and advanced along the first and second portions of the suture to provide the desired amount of lift.

[c51] A method of performing a cosmetic surgery procedure as recited in claim 50, wherein the insertion point is approximately at the frontal hairline.

[c52] A method of performing a cosmetic surgery procedure as recited in claim 50, wherein the insertion point is approximately at the midpoint between the brow and the frontal hairline.

[c53] A method of performing a cosmetic surgery procedure as recited in claim 45, wherein:
(a)the cosmetic surgery procedure is a thigh lift and the insertion point is generally at the inguinal crease;
(b)the first end of the suture is pushed cranially through subepidermal tissue until the first end of the suture extends out of the tissue; and

(c)the second end of the suture is pushed caudally through subepidermal tissue until the second end of the suture extends out of the tissue on the thigh.

[c54] A method of performing a cosmetic surgery procedure as recited in claim 45, wherein:

(a)the cosmetic surgery procedure is a breast lift and the insertion point is at the upper aspect of the breast curvature;

(b)the first end of the suture is pushed through subcutaneous tissue, dermal tissue, and pectoralis muscle until extending out of the tissue at an exit point on the upper portion of the breast; and

(c)the second end of the suture is pushed caudally through fibrous and fatty tissues until the second end of the suture extends out of the tissue at an exit point along the anterior aspect or the lower curvature of the breast.

[c55] A method of performing a cosmetic surgery procedure using a barbed suture including an elongated body, first and second sharp pointed distal ends for penetrating tissue, and a plurality of barbs extending from the periphery of the body, the barbs on a first portion of the body between the first end of the suture and a first axial location on the body for permitting movement of the suture through the tissue in a direction of movement of the first end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the first end, and the barbs on a second portion of the body between the second end of the suture and a second axial location on the body which is less than the distance from the second end to the first axial location permitting movement of the suture through the tissue in a direction of movement of the second end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the second end, and using an insertion device including a tubular element in which the suture is initially disposed, the insertion device having leading and trailing ends with openings therein with the first end of the suture proximate to the leading end, the method comprising the steps of:

(a)inserting the first pointed end of the suture and the leading end of the insertion device at an insertion point;

(b)pushing the first end of the suture and the leading end of the insertion device

through tissue beneath the epidermis until reaching an endpoint;
 (c)gripping and pulling the insertion device at the trailing end to remove the insertion device, leaving the suture in place; and
 (d)manually grouping and advancing the tissue along the first portion of the suture to provide the desired amount of lift.

[c56] The method of performing a cosmetic surgery procedure as recited in claim 55, wherein:

(a)the cosmetic surgery is a facelift;
 (b)the insertion point is in the scalp at a point distal from the temporal hairline;
 (c)the suture is pushed through the reticular dermis underneath the scalp; and
 (d)the first end of the suture then passes through the temporal hairline, penetrating the facial tissue selected from a group consisting of the reticular dermis, the superficial muscular aponeurotic system, and a combination thereof, extending to be proximate to the nasolobial fold.

[c57] The method of performing a cosmetic surgery procedure as recited in claim 55, wherein:

(a)the cosmetic surgery is a browlift;
 (b)the insertion point is in the scalp at a point distal from the frontal hairline; and
 (c)the suture is pushed through the reticular dermis underneath the scalp until the first end of the suture passes through the frontal hairline, extending to be proximate to the inferior aspect of the brow line.

[c58]

A method for joining and holding closed for healing and regrowth an axial wound in a blood vessel such as an artery or vein, using a barbed suture including an elongated body, first and second sharp pointed distal ends for penetrating tissue, and a plurality of barbs extending from the periphery of the body, the barbs on a first portion of the body between the first end of the suture and a first axial location on the body for permitting movement of the suture through the tissue in a direction of movement of the first end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the first end, and the barbs on a second portion of

the body between the second end of the suture and a second axial location on the body which is less than the distance from the second end to the first axial location permitting movement of the suture through the tissue in a direction of movement of the second end and preventing movement of the suture relative to the tissue in a direction opposite the direction of movement of the second end, and using an insertion device, including a tubular element in which the suture is initially disposed, the insertion device having leading and trailing ends with openings therein with the first end of the suture proximate to the leading end, the method comprising the steps of:

- (a) inserting the first pointed end of the suture and the leading end of the insertion device through an entry point in the tissue spaced from and on one side of the wound;
- (b) pushing the first end of the suture and leading end of the insertion device through the tissue until the first end of the suture and the leading end of the insertion device penetrate the blood vessel wall on one side of the wound, extend into the interior of the blood vessel, penetrate the blood vessel wall on the other side of the wound, and penetrate the tissue on the other side of the wound;
- (c) gripping and pulling the insertion device at the trailing end to remove the insertion device, leaving the suture in place; and
- (d) advancing the tissue on the two sides of the wound together as necessary to close the wound.

[c59] A method for joining and holding closed for healing and regrowth an axial wound in a blood vessel as recited in claim 58, further comprising the step of pushing the first end of the suture and the leading end of the insertion device through the tissue until the second axial location is disposed outside the blood vessel wall on one side of the wound and the first axial location is disposed outside the blood vessel wall on the other side of the wound, whereby there are no barbs disposed in the interior of the blood vessel.